

What is claimed:

1. An intermediate laminated structure comprising a plurality of unfired ceramic plates stacked along a laminating direction, each of said plates having a plurality of holes formed therethrough by a punching operation, wherein at least a first hole in one of said plurality of unfired ceramic plates has the same shape and cross-sectional area as respective first holes in the remaining plurality of unfired ceramic plates such that said first holes define a cylinder of constant cross-sectional area throughout the entire thickness of said intermediate laminated structure.
2. The intermediate laminated structure according to claim 1, wherein each of said plurality of holes in said one of said plurality of unfired ceramic plates has the same shape and cross-sectional area as respective holes in the remaining plurality of unfired ceramic plates such that said holes define a plurality of cylinders of constant cross-sectional area throughout the entire thickness of said intermediate laminated structure.
3. The intermediate laminated structure according to claim 2, wherein a ratio of an axial length of each said cylinder to a diameter of said cylinder, or a ratio of an axial length of said cylinder to a minimum distance between opposing edges on an opening surface of said cylinder, is in a range of about 1:1 to about 15:1.
4. The intermediate laminated structure according to claim 2, wherein a ratio of an axial length of each said cylinder to a space between said cylinder and adjacent cylinders is in a range of about 1:1 to about 15:1.
5. The intermediate laminated structure according to claim 2, wherein a diameter of each said cylinder, or a minimum distance between opposing edges on an opening surface of each said cylinder, is less than or equal to 100 μm .
6. The intermediate laminated structure according to claim 2, wherein a space between adjacent cylinders is less than or equal to 100 μm .

7. The intermediate laminated structure according to claim 1, wherein said unfired ceramic plates comprise a compound insulating material comprising a plastic resin and a ceramic material.

8. The intermediate laminated structure according to claim 1, wherein said unfired ceramic plates have a Young's modulus of 3000 kgf/mm² or less and a tensile strength of 20 kgf/mm² or less.

9. An intermediate laminated structure comprising a plurality of unfired ceramic plates stacked along a laminating direction, each of said plates having a plurality of holes formed therethrough by a punching operation, wherein at least a first hole in one of said plurality of unfired ceramic plates has the same shape and cross-sectional area as respective first holes in the remaining plurality of unfired ceramic plates such that said first holes define a cylinder of constant cross-sectional area throughout the entire thickness of said intermediate laminated structure,

wherein said intermediate laminated structure is fabricated by a method comprising the steps of:

providing a punching machine comprising at least one punch, a die, and a stripper;

providing a predetermined number of said unfired ceramic plates;

forming at least a first hole in a first unfired ceramic plate with said punch and pulling up said first unfired ceramic plate by closely attaching said first unfired ceramic plate to said stripper while leaving said punch in said first hole;

forming at least a first hole in a second unfired ceramic plate with said punch and pulling up said second unfired ceramic plate together with said first unfired ceramic plate while leaving said punch in said second hole; and

forming first holes in the remaining unfired ceramic plates and sequentially stacking the punched unfired ceramic plates along said punch as a stacking axis.

10. The intermediate laminated structure according to claim 9, wherein each of said plurality of holes in said one of said plurality of unfired ceramic plates has the same shape and cross-sectional area as respective holes in the remaining plurality of unfired ceramic plates such that said holes define a plurality of cylinders of constant cross-sectional area throughout the entire thickness of said intermediate laminated structure.

11. An intermediate laminated circuit substrate comprising:
a plurality of insulators comprising unfired ceramic plates; and
a plurality of conductors formed on said insulators; and
at least one cylinder defined by a plurality of first holes formed in each of said insulators and conductors by a punching operation and passing through all of said insulators and conductors, wherein at least a first hole in one of said plurality of insulators and conductors has the same shape and cross-sectional area as respective first holes in the remaining plurality of insulators and conductors such that said cylinder has a constant cross-sectional area throughout the entire thickness of said intermediate laminated circuit substrate.

12. The intermediate laminated circuit board substrate according to claim 11, wherein each of said plurality of holes in said one of said plurality of insulators and conductors has the same shape and cross-sectional area as respective holes in the remaining plurality of said insulators and conductors such that said holes define a plurality of cylinders of constant cross-sectional area throughout the entire thickness of said intermediate laminated circuit substrate.

13. The intermediate laminated circuit substrate according to claim 12, wherein a ratio of an axial length of each said cylinder to a diameter of said cylinder, or a ratio of an axial length of each said cylinder to a minimum distance between opposing edges on an opening surface of said cylinder, is in a range of about 1:1 to about 15:1.

14. The intermediate laminated circuit substrate according to claim 12, wherein a ratio of an axial length of each said cylinder to a space between said cylinder and adjacent cylinders is in a range of about 1:1 to about 1:15.

15. An intermediate laminated circuit substrate comprising:

a plurality of conductors, a plurality of insulators for insulating said conductors stacked together with said conductors, said insulators comprising unfired ceramic plates, and at least one cylinder defined by a plurality of first holes formed in each of said insulators and conductors by a punching operation and passing through all of said insulators and conductors, wherein at least a first hole in one of said plurality of insulators and conductors has the same shape and cross-sectional area as respective first holes in the remaining plurality of said insulators and conductors such that said cylinder has a constant cross-sectional area throughout the entire thickness of said intermediate laminated circuit substrate,

wherein said intermediate laminated circuit substrate is fabricated by a method comprising the steps of:

providing a punching machine comprising at least one punch, a die, and a stripper;

providing a plurality of wiring boards comprising an insulating unfired ceramic material and having respective circuits formed thereon;

forming at least a first hole in a first wiring board with said punch and pulling up said first wiring board by closely attaching said first wiring board to said stripper while leaving said punch in said first hole of said first wiring board;

forming at least a first hole in a second wiring board with said punch and pulling up said second wiring board together with said first wiring board while leaving said punch in said first hole of said second wiring board; and

forming first holes in the remaining wiring boards and sequentially stacking the punched wiring boards along said punch as a stacking axis.

16. An intermediate laminated circuit substrate comprising:

a base substrate comprising a plurality of conductors, a plurality of insulators for insulating said conductors stacked together with said conductors, said insulators comprising unfired ceramic plates, and at least one cylinder defined by a plurality of first holes formed in each of said insulators and conductors by a punching operation and passing through all of said insulators and conductors, wherein at least a first hole in one of said plurality of insulators and conductors has the same shape and cross-sectional area as respective first holes in the remaining plurality of said insulators and conductors such that said cylinder has a constant cross-sectional area throughout the entire thickness of said intermediate laminated circuit substrate; and

at least one build-up layer formed on at least one side of said base substrate, said build-up layer comprising at least one conducting layer and at least one insulating layer alternately stacked together with said conducting layer.

17. The intermediate laminated circuit substrate according to claim 16, wherein each of said plurality of holes in said one of said plurality of insulators and conductors has the same shape and cross-sectional area as respective holes in the remaining plurality of said insulators and conductors such that said holes define a plurality of cylinders of constant cross-sectional area throughout the entire thickness of said intermediate laminated circuit substrate.

18. The intermediate laminated circuit substrate according to claim 17, wherein a ratio of an axial length of each said cylinder to a diameter of said cylinder, or a ratio of an axial length of each said cylinder to a minimum distance between opposing edges on an opening surface of said cylinder, is in a range of about 1:1 to about 15:1.

19. The intermediate laminated circuit substrate according to claim 17, wherein a ratio of an axial length of each said cylinder to a space between said cylinder and adjacent cylinders is in a range of about 1:1 to about 15:1.

20. An intermediate laminated circuit substrate comprising:

a base substrate comprising a plurality of conductors, a plurality of insulators for insulating said conductors stacked together with said conductors, said insulators comprising unfired ceramic plates, and at least one cylinder defined by a plurality of first holes formed in each of said insulators and conductors by a punching operation and passing through all of said insulators and conductors, wherein at least a first hole in one of said plurality of insulators and conductors has the same shape and cross-sectional area as respective first holes in the remaining plurality of said insulators and conductors such that said cylinder has a constant cross-sectional area throughout the entire thickness of said intermediate laminated circuit substrate, and

at least one build-up layer formed on at least one side of said base substrate, said build-up layer comprising at least one conducting layer and at least one insulating layer alternately stacked together with said conducting layer,

wherein said intermediate laminated circuit substrate is fabricated by a method comprising the steps of:

providing a punching machine comprising at least one punch, a die, and a stripper;

providing a plurality of wiring boards comprising an insulating unfired ceramic material and having respective circuits formed thereon;

forming a first hole in a first wiring board with said punch and pulling up said first wiring board by closely attaching said first wiring board to said stripper while leaving said punch in said first hole of said first wiring board;

forming a first hole in a second wiring board with said punch and pulling up said second wiring board together with said first wiring board while leaving said punch in said first hole of said second wiring board;

forming first holes in the remaining wiring boards and sequentially stacking said punched wiring boards along said punch as a stacking axis to form said base substrate; and

forming said build-up layer on said base substrate.